3503

BOARD DIPLOMA EXAMINATION, (C–09)

MARCH/APRIL—2014

DME—FOURTH SEMESTER EXAMINATION

STRENGTH OF MATERIALS

Time : 3 hours]　　　　　　　　　　　　　　　　[*Total Marks* : 80

PART—A　　　　　　　　　　　3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. An MS bar carries on axial load of 75 kN. If the allowable tensile stress is $50 \, N/mm^2$, find the diameter of the bar.

2. A rod of 32 m long is rigidly fixed at a temperature of 20 °C. Find the stress induced in the rod if the temperature is raised to 90 °C. Take $E = 1 \times 10^5 \, N/mm^2$ and $\alpha_s = 12 \times 10^{-6} /°C$.

3. An MS specimen of 15 mm diameter and 50 mm gauge length is subjected to a sudden axial pull of 32 kN. Calculate the maximum stress and elongation. Take $E = 200 \, kN/mm^2$.

4. List any three types of beams.

5. Define the following terms :

(a) Reactions

(b) Point of contraflexure

6. Define the following terms :

(a) Bending stress

(b) Section modulus

7. A cantilever beam of length 3 m carries point load at free end. If the maximum slope is 0·01 radians, calculate the deflection at free end.

8. Define the terms spring index and stiffness related to springs.

9. A hollow circular shaft is having 50 mm external diameter and 35 mm internal diameter. Determine the polar moment of inertia of the shaft.

10. A 12 mm thin cylindrical shell having 2·2 m diameter and 5 m length is subjected to a fluid pressure of 2 N/mm^2. Calculate circumferential strain. Assume Poisson's ratio as 0·3 and Young's modulus as 2·1 × 10^5 N/mm^2.

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Discuss the behaviour of a Mild Steel specimen when subjected to a tensile test.

12. A concrete cylinder of diameter 150 mm and length 300 mm when subjected to an axial compressive load of 240 kN resulted in an increase of diameter by 0·127 mm and decrease in length by 0·28 mm. Find the Poisson's ratio and values of three elastic constants.

13. With usual notations, derive an expression for the strain energy in case of impact loading.

14. A simply supported beam of span 8 m carries a UDL of 20 kN/m up to a distance of 4 m from left support and a point load of 40 kN at a distance of 2 m from right support. Draw shear force and bending moment diagrams.

15. A cantilever beam of length 8 m is subjected to the load as shown in figure below. Draw shear force and bending moment diagrams :
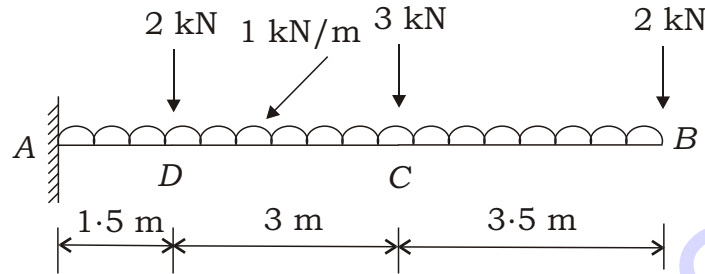
16. A simply supported beam is 200 × 350 mm in section and 6 m long. If the permissible bending stress is $100 \, \text{N} / \text{mm}^2$. Find the—

(a) point load that can be applied at the centre of the beam;

(b) uniformly distributed load that can be applied on the entire span.

17. A wagon weighting 50 kN is moving at 10 kmph. How many springs each of 18 coils will be required in a buffer stop to absorb the energy of motion with a compression of 250 mm. The mean diameter of coil is 200 mm and wire diameter is 20 mm. Take $G = 0·9 \times 10^5 \, \text{N} / \text{mm}^2$.

18. *(a)* A hollow shaft of 100 mm outside diameter and 80 mm inside diameter is having an allowable stress of $60 \, \text{N} / \text{mm}^2$. Find the torque transmitted and stress at a radius of 40 mm from the axis of the shaft.

(b) A water main 1·5 m diameter contains water at a pressure head of 100 m. If the specific weight of water is $9810 \, \text{N} / \text{m}^3$, find the thickness of the metal required for water main. Given permissible stress is $30 \, \text{N} / \text{mm}^2$.

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